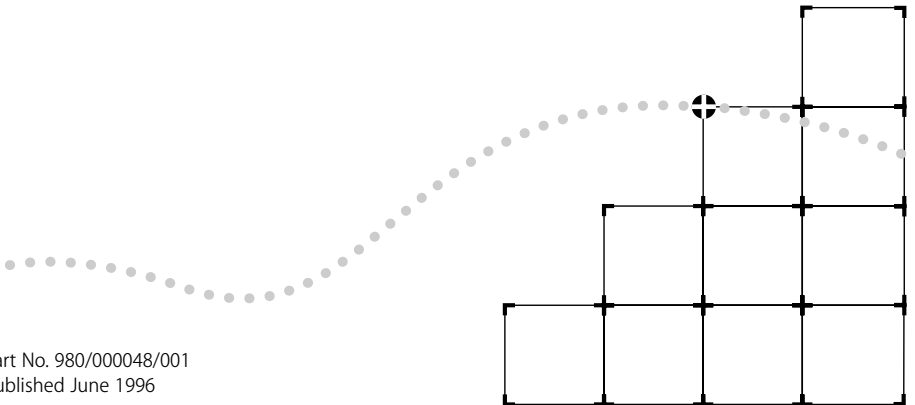




ACCESSBUILDER 7000 TRIPLE MODEM MODULE USER GUIDE



Part No. 980/000048/001
Published June 1996

3Com Corporation ■ 5400 Bayfront Plaza ■ Santa Clara, California ■ 95052-8145

© 3Com Europe Ltd, 1996. All rights reserved. No part of this documentation may be reproduced in any form or by any means or used to make any derivative work (such as translation, transformation, or adaptation) without permission from 3Com Europe Ltd.

3Com Europe Ltd. reserves the right to revise this documentation and to make changes in content from time to time without obligation on the part of 3Com Europe Ltd to provide notification of such revision or change.

3Com Europe Ltd provides this documentation without warranty of any kind, either implied or expressed, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. 3Com may make improvements or changes in the product(s) and/or the program(s) described in this documentation at any time.

UNITED STATES GOVERNMENT LEGENDS:

If you are a United States government agency, then this documentation and the software described herein are provided to you subject to the following restricted rights:

For units of the Department of Defense:

Restricted Rights Legend: Use, duplication or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) for restricted Rights in Technical Data and Computer Software clause at 48 C.F.R. 52.227-7013. 3Com Europe Limited, Merchants' House, Wilkinson Road, Cirencester, Gloucestershire, GL7 1YT United Kingdom.

For civilian agencies:

Restricted Rights Legend: Use, reproduction or disclosure is subject to restrictions set forth in subparagraph (a) through (d) of the Commercial Computer Software - Restricted Rights Clause at 48 C.F.R. 52.227-19 and the limitations set forth in 3Com Corporation's standard commercial agreement for the software. Unpublished rights reserved under the copyright laws of the United States.

If there is any software on removable media described in this documentation, it is furnished under a license agreement included with the product as a separate document, in the hard copy documentation, or on the removable media in a directory file named LICENSE.TXT. If you are unable to locate a copy, please contact 3Com and a copy will be provided to you.

Unless otherwise indicated, 3Com registered trademarks are registered in the United States and may or may not be registered in other countries.

3Com, AccessBuilder, Boundary Routing, LANplex, LanScanner, LinkBuilder, NETBuilder, NETBuilder II, Parallel Tasking, ViewBuilder, EtherDisk, EtherLink, EtherLink Plus, EtherLink II, SmartAgent, TokenLink, TokenLink Plus, TokenDisk and Transcend are registered trademarks of 3Com Corporation. 3TECH, CacheCard, FDDILink, FMS, NetProbe and Star-Tek are trademarks of 3Com Corporation. 3ComFacts is a service mark of 3Com Corporation.

Novell and NetWare are registered trademarks of Novell Inc. Windows is a trademark of Microsoft Corporation. VT100 is a registered trademark of Digital Equipment Corporation.

Other brand and product names may be registered trademarks or trademarks of their respective holders.

IMPORTANT SAFETY INFORMATION



WARNING: *Warnings contain directions that you must follow for your personal safety. Follow all instructions carefully.*

Please read carefully and thoroughly the following information before installing the AccessBuilder 7000 Triple Modem Module:

- Exceptional care must be taken during installation and removal of the module.
- The safety status of the interconnection ports on this equipment are as follows:

Ports identified by the label PSTN and LEASE = TNV

Ports identified by the labels DTE = SELV

TNV (telecoms network voltage) is a circuit which under normal operating conditions carries telecommunication signals.

SELV (safety extra low voltage) is a secondary circuit which is designed and protected so that under normal and single-fault conditions, the voltage between any two accessible parts does not exceed a safe value (42.2 V peak or 60 V DC).

Only connect apparatus complying with the relevant interface requirements to the ports on this unit.

WICHTIGE SICHERHEITSHINWEISE



ACHTUNG: Die Warnungen enthalten Anweisungen, die Sie zur eigenen Sicherheit zu befolgen haben.

Lesen Sie bitte die folgenden Informationen sorgfältig durch, bevor Sie den AccessBuilder 7000 Triple Modem Module einbauen:

- Auf besondere Vorsicht muß während des Ein- und Ausbaus des Einheits geachtet werden.
- Der Sicherheitsstandard der Anschlüsse fuer dieses Gerät sind wie folgt:

Anschlüsse bezeichnet mit PSTN und LEASE = TNV

Anschlüsse bezeichnet mit DTE = SELV

TNV (Telecoms Network Voltage - Spannung des Telekommunikationsnetzwerks) ist ein Anschluss, der unter normalen Umständen Telekommunikationssignale enthält .

SELV (Safety Extra Low Voltage - Extra Sicherheitsspannung) ist ein weiterer Anschluss, der unter normalen Umständen und Fehlerkonditionen entworfen und gesichert wurde, so dass die Spannung zwischen zwei erreichbaren Teilen kein gefährliches Niveau erreicht (42.2V max. oder 60V DC).

An den Anschlussbuchsen der Geräte dürfen nur die dafür vorgesehenen Anschlüsse verwendet werden.

L'INFORMATION DE SÉCURITÉ IMPORTANTE



AVERTISSEMENT: *Les avertissements contiennent les instructions que vous devez suivre pour votre sécurité personnelle. Suivre toutes les instructions avec soin.*

Veillez lire à fond l'information suivante avant d'installer le moyeu:

- Le soin exceptionnel doit être pris pendant l'installation et l'enlèvement du moyeu.
- Les normes de sécurité des ports d'interconnexion sur cet équipement sont les suivants:

Les ports marqués par les étiquettes PSTN et LEASE = TNV

Les ports marqués par les étiquettes DTE = SELV

TNV (Telecoms Network Voltage - tension réseau de télécommunications) est un circuit qui dans des conditions d'opérations normales, transfère les signaux télécoms.

SELV (Safety Extra Low Voltage - tension de sécurité extra-réduite) est un circuit secondaire désigné et protégé qui dans des conditions normales et de fautes uniques, assure que la tension entre deux éléments accessibles n'accèdera pas un niveau de sécurité (42.2V max. ou 60 V DC).

Connecter uniquement des unités conformes aux normes relatives des interfaces de cet équipement.

CONTENTS

IMPORTANT SAFETY INFORMATION **WICHTIGE SICHERHEITSHINWEISE** **L'INFORMATION DE SÉCURITÉ IMPORTANTE**

ABOUT THIS GUIDE

Introduction	1
How to Use This Guide	1
Conventions	2
Additional Safety Information	3

1 TRIPLE MODEM MODULE

Introduction	1-1
Principal Features	1-2
Implementation of V.32terbo	1-3
Typical Applications	1-5
Pack Contents Checklist	1-6
Registering Ownership of your Triple Modem Module	1-6
Pre-installation Requirements	1-7

2 INSTALLATION AND OPERATION

Overview	2-1
Installing The Module	2-2
Installing the Rear Card	2-3
Installing the Front Card	2-4
Connecting the Cables	2-5
Modem Lines 1-3	2-5
DTE Ports 1-3	2-5
Front Panel LEDs	2-6

3 TROUBLESHOOTING

- Troubleshooting Guide 3-1
 - Modem Health 3-1
 - Modem - DTE Connection 3-2
 - Modem - Telephone Line Connection 3-3
 - Connection Problems in Answering a Call 3-3
 - Connection Problems When Originating a Call 3-4
 - On-line Operation 3-6
 - Private-line Operation 3-6
 - Dial Backup Operation 3-6

A MODEM SPECIFICATION AND INTERFACE PIN ASSIGNMENTS

- Transmitter / Receiver Specifications A-1
- Autodial - Autoanswer A-2
- Physical Description A-3
- Approvals Information A-4
 - General Approvals Requirements A-4
 - Interference and Safety Requirements A-5
 - PBX and PABX Application A-6
 - Ringer Equivalence A-7
- DTE Port Pin Assignments A-8
 - X.21/V.11 A-8
 - V.24/V.28 A-9
 - V.35/V.36 A-10
- PSTN Port Cable Pin Assignments A-11
- Private Line Port Cable Pin Assignments A-12

B TECHNICAL SUPPORT

- On-line Technical Services D-1
 - 3Com Bulletin Board Service D-1
 - Access by Modem D-1
 - Access by ISDN D-2
 - World Wide Web Site D-2
- Support from Your Network Supplier D-3
- Support from 3Com D-4
- Returning Products for Repair D-5

INDEX

LIMITED WARRANTY

FCC CLASS A VERIFICATION STATEMENT

ABOUT THIS GUIDE

Introduction

This guide describes the features, installation and configuration of the AccessBuilder 7000 Triple Modem Module.

This guide assumes that you have installed your AccessBuilder 7000 Access Concentrator and that the phone lines to which you want to connect the modems are installed and operational.




How to Use This Guide

This table shows where to find specific information:

If you are looking for information on:	Turn to:
The Triple Modem Module's features and typical uses.	Chapter 1
Installation and descriptions of the front panel LEDs and rear panel connectors.	Chapter 2
Troubleshooting and problem solving.	Chapter 3
Technical information and cable specifications.	Appendix A
ASCII character table.	Appendix B
Regulatory information.	Appendix C
Technical support.	Appendix D

Conventions

The icon conventions that are used throughout this guide are:

Icon	Type	Description
	Information Note	Information notes call attention to important features or instructions.
	Caution	Cautions alert you to personal safety risk, system damage, or loss of data.
	Warning	Warnings alert you to the risk of severe personal injury.

The text conventions used in this guide are:

Convention	Description
"Enter" vs. "Type"	When the word "enter" is used in this guide, it means type something, then press the [Return] or [Enter] key. Do not press the [Return] or [Enter] key when an instruction simply says "type."
Text represented as screen display	This typeface is used to represent displays on your screen, for example: Enter the unit's IP address:
Text represented as commands	This typeface is used to represent commands that you enter, for example: CO IS NU
Keys	When specific keys are referred to in the text, they are called out by their labels, such as "the Return key" or "the Escape key," or they may be shown as [Return] or [Esc]. If two or more keys are to be pressed simultaneously, the keys are linked with a plus sign (+), for example: Press [Ctrl]+[Alt]+[Del].
<i>Italics</i>	<i>Italics</i> are used to denote <i>new terms</i> or <i>emphasis</i> .

Additional Safety Information

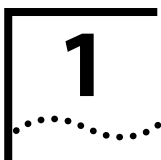


See also the Important Safety Information at the front of this guide.

When using the unit, observe the following safety information:

- Retain this user's guide for later use and pass it on in the event of change of ownership of the unit.
- Products manufactured by us are safe and without risk provided they are installed, used and maintained in good working order in accordance with our instructions and recommendations.
- If any of the following conditions occur, isolate the electricity supply and refer to your 3Com reseller.
 - If the module is damaged.
 - If the module begins to make an odd noise, smell or smoke.
 - If the module shows signs of a distinct change in performance.
- Never install telephone wires during a lightening storm, or install telephone connection sockets in wet locations, unless the socket is specifically designed for wet locations.
- Do not touch uninstalled telephone wires or terminals unless the telephone line has been disconnected at the network interface. Always exercise caution when installing or modifying telephone lines.
- Do not spill food or liquids on the unit. If the unit gets wet, isolate the electrical supply and contact your 3Com reseller.
- Do not push any objects into the openings of the unit. Doing so can cause fire or electric shock by shorting out internal components.
- Be sure nothing rests on the unit's system cables and that the cables are not located where they can be stepped on and cause damage to the unit.
- Keep the unit away from radiators and heat sources.
- Install the unit in a clean area free from dust or extreme temperatures.
- Interconnecting directly, or by way of other apparatus, to ports complying with SELV requirements may produce hazardous conditions on the network. Advice should be sought from a competent engineer before such a connection is made.





TRIPLE MODEM MODULE

Introduction

This chapter outlines the features and uses of the AccessBuilder 7000 Triple Modem Module when installed in the AccessBuilder 7000 Access Concentrator chassis.

The Triple Modem Module houses three modems on a single device module that operate independently of each other but are identical in the features and facilities they offer. Each modem is a fully featured, high speed device which provides reliable asynchronous and synchronous operation over dialled or private line networks.

The high speed transfer of up to 33.6 Kbps over dialled lines is guaranteed by using CCITT V.42bis/MNP Class 5 data compression and CCITT V.42/MNP error correction. IN addition to the fast line speeds, each modem can transfer data to the attached computer at speeds which can vary from 300 bps to 115200 bps.

The modems are compatible with a number of dialling methods and protocols, such as asynchronous AT commands and CCITT V.25bis dialling, which allow you to uses the modems in a variety of applications and environments. You can control each Triple Modem's configuration, dialling characteristics and diagnostic features. Five factory set configurations, containing the most commonly-used Triple Modem settings, are permanently stored in each Triple Modem's memory, providing a quick and easy method of a configuring a Triple Modem to be compatible with asynchronous and synchronous data environments over 2-wire or 4-wire Private lines or the PSTN.

Principal Features

- Support for dial-up transmission protocols:
 - V.34 – 2-wire full duplex modems operating at data signalling rates of 33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 and 2400 bps.
 - Non-proprietary V.32 terbo – 2-wire full duplex modems operating at data signalling rates of 19200, 16800, 14400, 12000, 9600, 7200 and 4800 bps.
 - V.32bis – 2-wire full duplex modems operating at data signalling rates of 14400, 12000, 9600, 7200 and 4800 bps.
 - V.32 – 2-wire full duplex modems operating at data signalling rates of 9600 and 4800 bps.
 - V.23 – 75/1200 bps operation.
 - V.22bis – 2400 bps full duplex operation.
 - V.22 and Bell 212A – 1200 bps full duplex 2-wire modem.
 - V.21 and Bell 103J – 300 bps modems.
- Support for leased line transmission protocols:
 - V.34 – 2-wire or 4-wire full duplex modems operating at data signalling rates of 33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 and 2400 bps.
 - Non-proprietary V.32 terbo – 2-wire or 4-wire full duplex modems operating at data signalling rates of 19200, 16800, 14400, 12000, 9600, 7200 and 4800 bps.
 - V.32bis – 2-wire or 4-wire full duplex modems operating at data signalling rates of 14400, 12000, 9600, 7200 and 4800 bps.
 - V.32 – 2-wire or 4-wire full duplex modems operating at data signalling rates of 9600 and 4800 bps.
- 2-wire PSTN backup of the Private line.
- CCITT V.42bis or MNP Class 5 data compression.
- Virtual error-free data passage using CCITT V.42 LAPM or MNP Level 4 error correction.

- Asynchronous dial DTE data rates from 300 to 115200 bps.
- Modem configuration changes using the DTE interface or through the Management Controller Module.
- Compatibility with the industry standard AT command set.
- Storage of up to 20 telephone numbers in directory locations.
- Dialling using AT commands, CCITT V.25bis commands or by raising DTR on the Host to modem interface, or by data being sent to the DTE interface.
- High-speed transmission using asynchronous or synchronous, or UNIX devices over full duplex dial networks, and 2-wire or 4-wire lines.
- Self testing facilities providing local and remote loopbacks, including CCITT-compatible V.54.
- Five factory-set configurations and two user definable configurations.
- Front panel LEDs to inform you of the current status of any of the three modems.
- Easy to install, configure and support.

Implementation of V.32terbo

Support of the V.32terbo transmission protocol is included as a feature in the modems. V.32terbo is a non-proprietary extension of the widely used CCITT V.32bis standard which increases the maximum data signalling rate from 14400 to 19200 bps over dial-up links or private lines.

Compatibility between V.32terbo and V.32bis is maintained in a similar manner as it is between V.32bis and V.32, in that an identical training sequence is used by each standard and that V.32terbo uses a subset of the speeds available in V.32bis.

By default, each modem's factory configurations enable V.32terbo to be negotiated as the optimum data rate on any given link allowing a 33% increase in line throughput, to 19200bps to be used wherever possible. Where the quality of the line is not good enough to enable transmission at 19200bps, an intermediate speed of 16800 bps can be

negotiated between modems, providing a 16.7% increase in speed over that which can be negotiated using V.32bis. If the modem you are calling is unable to operate at the same high speeds as your modem, an optimum data transfer rate is negotiated between the two using the default configuration settings.

When using the higher line speeds made available by V.32terbo, the throughput rate can be increased further by using the modem's error correction and data compression facilities. Compression factors remain virtually unaffected by the increase in line rate, thereby producing a real improvement in data transmission times over those achieved using V.32bis.

Typical Applications

The Triple Modem module is ideally suited for large central sites providing access for remote users to central site services. In the example shown in [Figure 1-1](#) a large number of remote users connect to the central site's AccessBuilder 7000 and gain access to the corporate LAN and its facilities through a terminal server (such as the 3Com CS3000/3100 series). The advantage of this method is that all devices on the corporate LAN can be accessed remotely by a large number of remote users.

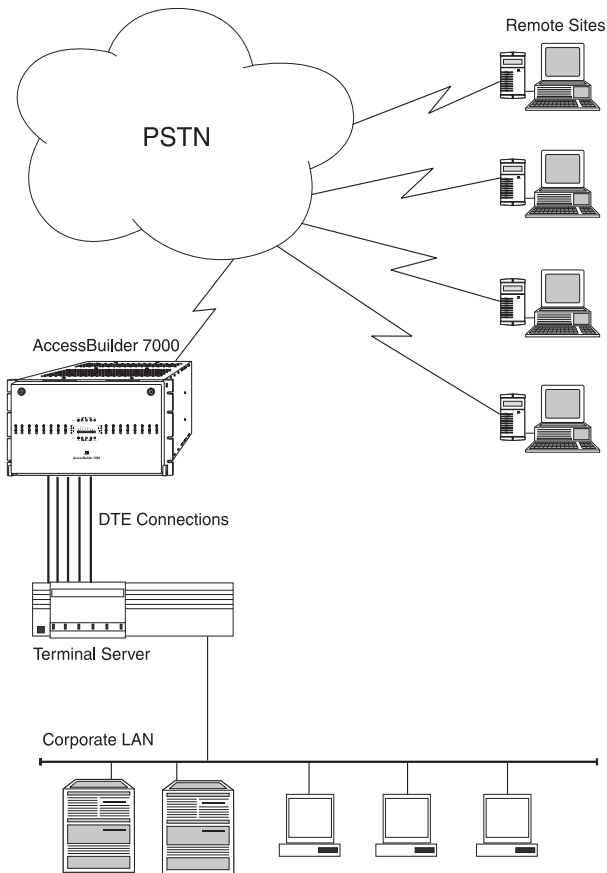


Figure 1-1 Modem Connections To The Central Site.

Pack Contents Checklist

Before you install your Triple Modem Module, check the contents of the box against the pack contents checklist below. If any of the items have been damaged in transit or are missing, then contact the 3Com reseller from whom the equipment was purchased.

- 1 x Triple Modem Module front card.
- 1 x Triple Modem Module back card.
- 1 x *AccessBuilder 7000 Triple Modem Module User Guide* (This manual).
- 1 x *AccessBuilder AT Command Reference* guide.
- 1 x warranty registration card.

It is important that you save the box and protective packing material in case you need to store, or transport your Triple Modem Module in the future.

Registering Ownership of your Triple Modem Module

A warranty registration card is enclosed in the box with your AccessBuilder 7000 Triple Modem Module. Please take a few moments before commencing the installation to fill in the card and post it to us.

Pre-installation Requirements

Before you install the Triple Modem Module into the AccessBuilder 7000 Access Concentrator chassis, check that the following requirements have been met:

- The AccessBuilder 7000 Access Concentrator must already be fitted with its power supply module(s) and the Management Controller Module if required.
- The rack unit into which you install the AccessBuilder 7000 must allow for the door to be fully opened to remove existing modules or to install new modules. During normal operation the door must remain closed.
- You should have DTE and telephone connection cables available and have easy access to telephone connection points.
- If you are using a terminal server for connection to your LAN, check that this is installed and configured for operation.

2

INSTALLATION AND OPERATION

Overview

This chapter describes how to install the AccessBuilder 7000 Triple Modem module into the AccessBuilder 7000 Access Concentrator chassis, how to connect to your DTEs and PSTN lines and how to read the LEDs on the module's front panel.



Ensure you read the safety information at the front of this guide before commencing installation of the AccessBuilder 7000 Triple Modem Module.

Check that you have met all the pre-requisites out-lined in [Chapter 1](#) and that you have access to the phone lines to connect your modems.

Installing The Module



Before installing the module, read the Safety Information at the front of this guide.

An AccessBuilder 7000 module consists of two parts; a front card and a back card that both connect to the chassis' backplane. It is recommended that you install the module's rear card into the chassis first.

The installation of the Triple Modem Module into the AccessBuilder 7000 chassis takes place in three distinct operations:

- Installing the front card.
- Installing the rear card.
- Connecting cables to the DTE and Line ports. See ["Connecting the Cables"](#) on [page 2-5](#) for more information about connecting to the ports.

Modules within the AccessBuilder 7000 system are designed to be hot swappable. It is not necessary to turn off the AccessBuilder 7000's power supply unit to install the Triple Modem Module. The Triple Modem Module can be inserted any slot in the AccessBuilder 7000 chassis.

No connecting cables are supplied with the Triple Modem Module as standard. For each of the three modems you need a PSTN line cable and/or a 2/4-wire private line cable. You also need a cable to connect your computer or DTE equipment to the DTE interface on the modem. The male DTE connector conforms to the electrical characteristics of V.24 as described in [Appendix A](#).



CAUTION: *At all times, take care not to touch any of the connectors or components on the cards to avoid damage by static electricity. Handle the cards by the handles or by their edges. Use an anti-static wrist strap during installation if you have one available.*

Installing the Rear Card

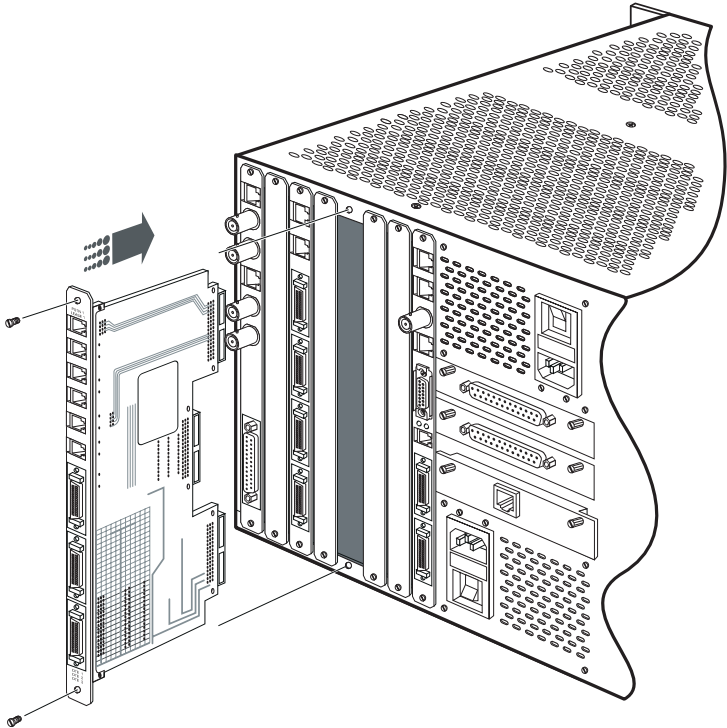


Figure 2-1 Installing The Rear Card

- 1** Locate the rear slot equivalent to the front slot into which you will install the front card.
- 2** Remove the metal blanking plate at the rear of the chassis and retain the screws.

Retain the blanking plate. If you remove the module, the blanking plate *must* be refitted to the chassis to aid the circulation of cooling air and to prevent dust and debris entering the unit.
- 3** Insert the rear card with the RJ45 ports at the top of the card and slide it home along the guide rails so that it connects with the backplane.
- 4** Secure the rear card into position using the screws from the blanking plate.

Installing the Front Card

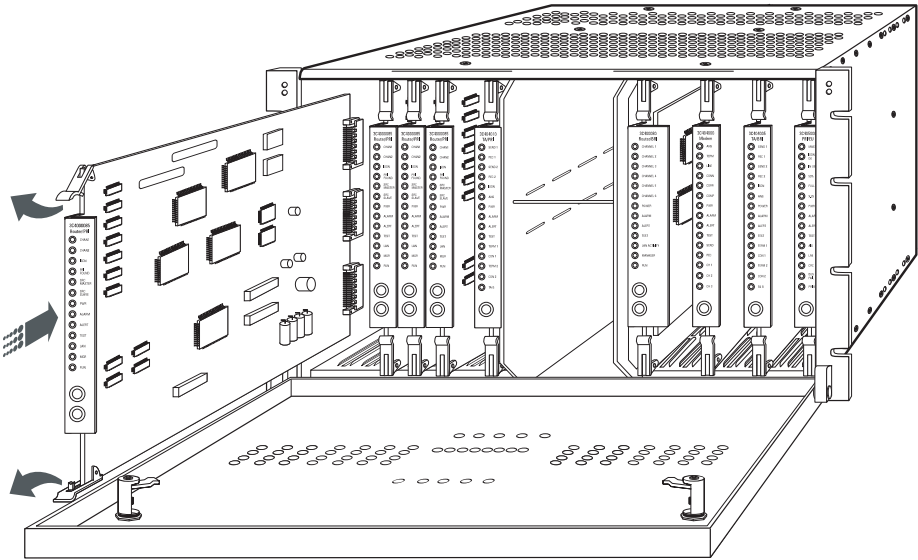


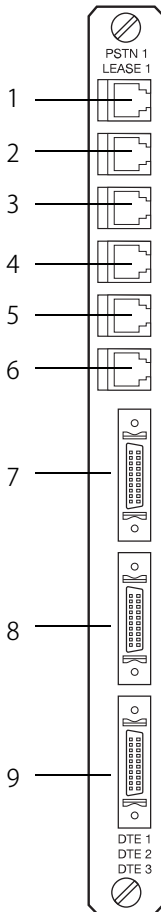
Figure 2-2 Example of Installing A Front Card

- 1 Locate the front slot in the AccessBuilder 7000 chassis equivalent to the rear slot in which you have already installed the rear card.
- 2 Insert the front card into the slot ensuring that it is centered along the guide rails.
- 3 Use the module's handles to push the card home into the chassis and lock it into place.
- 4 Close and lock the chassis door.

To remove the card, unlatch the handles to free the card from the back plane and pull the front card free from the chassis using the handles.

Connecting the Cables

The ports on the rear panel are arranged in two groups.



Modem Lines 1-3

Each modem port has two connections:

Dial Line (1, 3 & 5) The upper RJ45 connection in each pair connects to a normal dialled service, use this port to connect your modem to the line. In some countries you may need to use an adapter to connect to your PSTN service provider's socket.

If you use a two into one line adapter, a telephone handset can be connected in parallel to your modem at the PSTN outlet. In this case you must not lift the telephone handset during data transmission. If it is lifted, any noise in the surrounding area interferes with the data and can cause corruption in the transferred data.

Private Line (2,4 & 6) The lower RJ45 connection in each pair connects to a private line. Use this port to connect your modem to the line. In some countries you may need to use an adapter to connect to your PSTN service provider's socket.

DTE Ports 1- 3 (7,8 & 9)

Connect DTEs 1 through 3 to these ports using V.24 modem cable as described in [Appendix A](#).

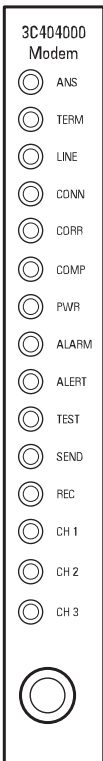
The DTE ports also allow direct access to the Triple Modem Module's management system using a PC or terminal. This removes the need to access the Triple Modem Module through the AccessBuilder 7000 Management Controller Module.

For more information about configuring the module, see the *AccessBuilder 7000 AT Command Reference*.

Front Panel LEDs

This section describes the Triple Modem Module's LEDs. Most of the LEDs can only be seen when the front door of the AccessBuilder 7000 chassis is open. When the door is closed, only the PWR, ALARM, ALERT and TEST LEDs can be seen. These LEDs show the status of the whole module.

The other status LEDs show information about one modem only. You can select the modem by toggling the push button at the foot of the module.



ANS (Answer) Lights to show that the selected modem is configured to automatically answer an incoming PSTN call. When an incoming call is detected, this LED flashes in sequence with each ring pulse.

TERM (Terminal) Shows that a DTE is attached to the selected modem's DTE interface and that DTR is raised. It is normally used to indicate that a call can be made or an incoming call answered. The modem may be configured to act in different ways on receipt of this signal according to the **AT&D** and **AT&M** commands. See *AccessBuilder 7000 AT Command Reference* for more information.

LINE (On Line) Indicates that the selected modem has seized the telephone line.

CONN (Connect) Indicates that the selected modem has established a valid connection to the remote device and is either negotiating the error correction and data compression protocols to be used on the link or it is ready to send and receive data. This LED does not indicate that the DCD (Data Carrier Detect) signal is high on the DTE interface.

CORR (Correct) Indicates that an error correcting link has been made with the remote modem. While using this facility, each time a re-send request is initiated by the selected modem the LED flashes for a short period.

COMP (Compress) Indicates that the data compression facility is active on the selected modem's link giving you the maximum throughput speed. During a call, this LED may go out when the modem is using V.42bis compression if the modem determines that the link cannot benefit from compression.

PWR (Power) When lit indicates that the module is receiving power from the chassis' backplane and that the power circuits are functioning correctly.

ALARM Lights to indicate that an event has occurred on one or more of the modems which has been configured to raise an alarm. See the *AccessBuilder 7000 Access Concentrator User Guide* for more information.

ALERT Lights to indicate that an event has occurred on one or more of the modems which has been configured to raise an alert. See the *AccessBuilder 7000 Access Concentrator User Guide* for more information.

TEST Indicates that one of the modems on the module is running a test. This may have been initiated either by an attached DTE, via the Management Controller Module or by a remote DTE to which the modem has a communications link.

SEND Flashes on and off to indicate that the selected modem is receiving data from the equipment attached to the DTE interface.

REC (Receive) Flashes on and off to indicate that the selected modem is passing received data from the line to the DTE interface.

CH 1 (Modem 1) Shows that Modem 1 is selected and that the LEDs show the status of this modem.

CH 2 (Modem 2) Shows that Modem 2 is selected and that the LEDs show the status of this modem.

CH 3 (Modem 3) Shows that Modem 3 is selected and that the LEDs show the status of this modem.

Push Button Selects the modem whose status is shown by the front panel LEDs. Toggle this button until the required Modem LED is lit.



3



TROUBLESHOOTING

Troubleshooting Guide

In this section we discuss the basic problems that can occur when using your modem. If you are having data communication difficulties such as periodic character loss, random errors, or constant format errors: use the loopback tests described in *AccessBuilder 7000 AT Command Reference*. With these tests you can usually isolate the fault in your system by using a process of elimination. If a problem continues to occur, contact your supplier for assistance.

Modem Health

POWER LED does not light

Make sure that the front and rear cards are pushed fully home, and that the rack enclosure is powered ON.

A problem is suspected after the power-up self-test

Initiate a local analogue loopback with a pattern test. If the modem consistently registers errors, contact your modem supplier.

If the modem passes these tests and you still have a problem, it is probably not with your modem.

Modem - DTE Connection

Modem does not accept or echo back AT commands

Check that the cable between the serial port of the DTE and the modem is a standard RS232 cable. If the cable is bad, replace it. (Null modem cables, also known as cross-over cables, do not work in this application).

A limited number of dumb terminals require DCD before they can talk to the modem. If this is the case you have to use a breakout box to raise DCD to the terminal. You can then configure the modems to force DCD using the **AT&C0** command.

Check that the character echo command is enabled using the **ATE** command.

Check that the DTE dialler type configuration option is set to AT. Refer to the **AT&M** or **AT&Q** command description.

Check that the response codes configuration option is enabled using the **ATQ** command.

Make sure that all AT commands are terminated with a carriage return.

Check that the ASCII value of a carriage return matches what is used by the DTE and the modem (defined using S-Register **S3**).

Check that the DTE and modem are using a compatible character format. Valid formats include 8 data bits with no parity, or 7 data bits with even, odd, mark or space parity.

Check that the DTE's data rate is supported by the modem.

Modem - Telephone Line Connection

Connection Problems in Answering a Call

Modem does not receive a dial tone

Attach a telephone direct to the wall outlet to check if a dial tone exists. Make sure the telephone line is connected to the appropriate modem's rear panel PSTN jack.

Modem does not go off-hook and answer an incoming call

Check that the auto-answer ring count configuration option (S-Register 0) is set to a value other than 0.

Check that the DTE is providing DTR to the modem.

If the DTE does not provide DTR to the modem, check that the modem's DTR signalling configuration option is set to ignore the state of DTR.

Check that all cables are attached to the right connectors at the rear of the modem.

Modem goes off-hook, answers, but does not connect

Perform a local analogue loop test and check that data entered at the DTE is echoed back to the DTE.

Check that the originating modem's configuration is compatible with your receiving modem's configuration.

Check that the originating modem recognizes your modem's answer tone.

Check that the originating modem supports your modem's operating protocols.

Force your modem to operate using the same transmission protocol as the originating modem to see if they connect.

Connection Problems When Originating a Call

Modem fails to go off-hook and originate a call

Check that the modem's configuration enables either AT dialling or V.25bis dialling. Note: A modem configured to accept AT commands cannot accept V.25bis commands, and vice versa.

If using DTR dialling, check the telephone number stored in directory location 1, and check that the DTE is raising DTR from OFF to ON to initiate a dial.

If using V.25bis asynchronous dialling, check that the correct character format is set to 7 data bits with even parity and 1 stop bit, and the carriage return and line feed are used as command terminators.

If using V.25bis bisynchronous dialling, check that the correct character format uses two synchronous control characters and a start-of-text control character before the text block, and an end-of-text control character after it.

If using V.25bis HDLC, check that the correct character format uses flag, address and control characters before the text block, and a frame sequence check and flag after the text block.

Modem dials but does not connect

If the modem is operating behind a PBX, check if a 9 and comma are needed before the telephone number.

Check whether tone or pulse dialling is needed.

Check if one modem is configured for error correction or disconnect, and the other modem is configured for no error correction. Try initiating the call in buffer mode.

If both modems use V.32bis or V.32, set the modem's V.32bis training configuration option to Long.

Intermittent disconnects, high error rates, or excessive retransmissions

Perform a remote digital loop test as described in the AccessBuilder 7000 AT Command Reference.

Modem establishes and disconnects a call

You may have a poor telephone line connection. Disconnect and dial again.

The remote modem may have encountered an error correction disconnect, where the modem is configured to establish a call using error correction. If the modem cannot negotiate error correction, then a disconnect occurs.

The remote modem may be in a forced error correction mode (disconnect if there is no error control). Reconfigure your modem to V.42/MNP or buffer correction and try again.

Perform a local analogue loop test.

On-line Operation

Data is scrambled

Check that the character format (data bits, parity, and stop bits) is set to the same value in both modems.

Missing data during a transfer

Check that you are using the same method of flow control for both the modem and the DTE.

If using XON/XOFF flow control, check that the modem's parity matches the DTE's parity.

Private-line Operation

Modems do not train-up on private lines

Check that the correct cabling is used for your application.

Check that one modem is configured for answer mode and the other is configured for originate mode.

Check that both modems are using the same modulation scheme.

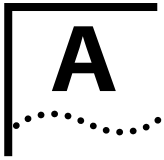
Dial Backup Operation

Modems do not establish a PSTN link when the Private line fails

Check that the communicating modems are configured to support dial backup, as described in the *AccessBuilder 7000 AT Command Reference*.

Check that one modem is configured to initiate the backup (i.e. is the master modem, and has the backup telephone number stored in its directory location 8) and the other modem is configured to be a slave (its directory location 8 is empty).

Check that both modems are using the same modulation scheme over their PSTN line.



MODEM SPECIFICATION AND INTERFACE PIN ASSIGNMENTS

Transmitter / Receiver Specifications

Modulation

CCITT V.34 (33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400 bps)

Non-proprietary V.32terbo (19200, 16800, 14400, 12000, 9600, 7200, 4800 bps)

CCITT V.32bis (14400, 12000, 9600, 7200, 4800 bps)

CCITT V.32 (9600, 4800 bps)

CCITT V.22bis (2400 bps)

CCITT V.22 (1200 bps)

CCITT V.21 (300 bps)

Bell 212A (1200 bps)

Bell 103J (300 bps)

Operation

2-wire or 4-wire synchronous/asynchronous private line, or 2-wire PSTN operation.

Output level

Selectable 0 dBm to -15 dBm. 600 ohms impedance. (UK versions set to -9 dBm for PSTN operation or -13 dBm for private wire.)

Data Input

Serial binary. Complies with CCITT V.28. Accepts levels ± 3 volts to ± 25 volts. (+)= space (-)= mark. Single wire ground return. 3000 to 7000 ohms load.

Data Output

Serial binary. Complies with CCITT V.28 ± 12 volts nominal. Output impedance 300 ohms.

Synchronization

RTS/CTS delay dependent on modulation format.

Equalizer

Automatic adaptive equalizer.

Error correction

V.42 LAPM and MNP4.

Data compression

V.42bis and MNP5.

Autodial - Autoanswer**Method**

Pulse dial. 10 pps rate. Make period 33 msec. Break period 67 msec (UK version). Interdigit period 800msec. Tone dial. On time 85 msec. ID time 85 msec. Duty cycle 50%.

Line Interface

600 ohm impedance. Bell tinkle suppression provided. Old and new dial tone detection. Secondary dial tone detection for PABX use. Progress tones and answer tone detection.

Protocols

Extended AT command set. Non-volatile memory. 5 preset factory, 2 user defined configurations and one power-up configuration. 20 stored telephone numbers. AT or V.25bis asynchronous, bisynchronous and HDLC synchronous commands are entered via the DTE interface. ASCII or EBCDIC character set used in V.25bis command mode.

Autoanswer

CCITT V.25 compliant.

Busy

Busy out via AT command or DTR.

Disconnect

Call cleared selectable on loss of DTR; and/or no carrier for n seconds; and/or no data for n seconds; and/or a disconnect request is received from the remote modem in error correction.

Test Functions

Local analogue loop, local digital loop, or remote digital loop available using AT commands.

Physical Description**Power**

16V ac, 47 to 63 Hz, 1A max. Typical power consumption 11 Watts.

Environment

Temperature 0 to 40 degrees centigrade operating. -50 to 70 degrees centigrade storage.

Relative humidity 5% to 95% non-condensing.

Altitude to 3000 meters.

Approvals Information

This product complies with the electro-magnetic compatibility (EMC) requirements of EN 55022 Class A and EN 50082 (susceptibility).

The product carries the *CE* certification mark to indicate conformance with the following EU directives:

- LVD (Low Voltage Directive (Safety) 73/23/EEC.
- EMC (Electro Magnetic Compatibility) Directive 89/336/EEC.
- TTE (Telecommunication Terminal Equipment) Directive 91/263/EEC.

This product also meets the safety requirements of EN41003 and EN60950.

See also the FCC and CSA statements at the back of this guide.

General Approvals Requirements

This section pertains to the approval of the modems, and to your country's approvals board requirements and notices for use of these modems. Users of this module should pay particular attention to this information. This unit is approved for connection to the telecommunications systems specified in the instructions for use, subject to the conditions set out in them.

Each modem is suitable for connection to the general switched telephone network (GSTN/PSTN) and extensions on compatible PABXs. It is also suitable for use on point-to-point private circuits, omnibus or multipoint circuits, using two or four wire termination (provided by Approved Telecommunication Operators), or to a relevant branch system.

If any other apparatus, including cable or wiring, is to be connected between the apparatus and the point of connection to a 2-wire or 4-wire speech band circuit, then all that other apparatus shall conform to the following:

- The overall transmission characteristics of all that other apparatus shall be such as to introduce no material effect upon the electrical conditions presented to one another by the apparatus and the digital circuit.

- All the other apparatus shall comprise only:
 - Apparatus approved (see note) for the purpose of connection between the apparatus and the digital circuit; and
 - Cable or wiring complying with a code of practice for the installation of apparatus covered by this standard or such other requirements as may be applicable.



Such apparatus may have been approved subject to limitations on its use.

This modem is suitable for use on telephone lines provided with loop-disconnect or multi-frequency (MF) dialling facilities.

This modem is suitable for household, office and similar indoor use, but is not suitable for use on an extension to a payphone, or a 1+1 carrier system.

This unit may be used on circuits with CEPT L1 signalling at a nominal frequency of 2280 Hz. It does not require signalling or otherwise employ the frequency range 0 Hz to 200 Hz and there is no requirement for DC from the telephone line for correct operation.

This unit causes a line voltage drop of 0.2 V at a line current of 40 mA

Interference and Safety Requirements

Radio frequency interference may be caused by incorrect operation or inadequate maintenance of this equipment. This unit is intended for use with screened digital cables.

If any of your apparatus is not operating correctly, you should immediately remove it from the telephone line as this may harm the telephone network (GSTN).

The approval of this unit for connection to GSTN or private speech band circuits is invalid if the apparatus is subject to modification in any material way not authorized or if it is used with or connected to internal software which has not been formally accepted.



CAUTION: Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type of battery as specified by the manufacturer. A used battery must be disposed of in accordance with the manufacturer's instructions.

PBX and PABX Application

This unit has been approved for use of the following facilities.

- Loop-disconnect and multi-frequency signalling.
- Storage of telephone numbers for retrieval by a predetermined code.
- Detection of initial proceed indication.
- Detection of secondary proceed indication.
- Operation in the absence of proceed indication.
- Automatic dialling facilities.
- Tone detection, for example, ring tone, busy tone.
- Automatic answering of incoming calls.
- Automatic clearing from call originating end.
- Call progress monitor.
- Series connection (via optional cable).
- Modem.

Any other usage will invalidate the approval of the apparatus if as a result it then ceases to conform to the standards against which approval was granted.

This unit is only approved for compatible PBXs. The supplier of your unit should be consulted for an up-to-date list of PBXs with which this unit is compatible.

There is no guarantee of correct working in all circumstances. Any difficulty should be referred to the supplier of the unit.

This unit is suitable for connection to PBXs which return secondary proceed indication.

Ringer Equivalence

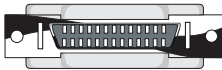
REN is a guide to the maximum number of apparatus (for example, telephones) that can be simultaneously connected to one telephone line. The REN value of each apparatus is added together and must not exceed 4. Unless otherwise marked, a telephone can be assumed to have a REN of 1.0. Each modem on this unit has a ringer equivalence number (REN) of 4.0.

DTE Port Pin Assignments

Each modem is equipped with a single serial port marked DTE, which can be used to enter asynchronous AT or V.25bis commands, and pass asynchronous or synchronous user data. This is a female 26-pin V.24 connector and can be used with X.21/V.11, v.24/V.28 or V.35/V.36 signalling. The cable pin-outs for each type of cable are shown below.

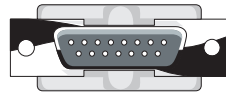
X.21/V.11

The DTE port terminates with a 26-way miniature SCSI connector. The port can be configured to support V.11 signalling characteristics. The DTE port connecting cable is not supplied with the module. The following signalling characteristics should be observed when purchasing or fabricating a suitable cable.



3Com end – pin no.

(26-way male SCSI connector)



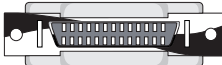
Client end – pin no.

(15-way male or female D-type)

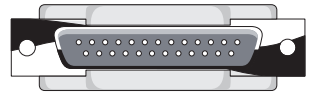
Transmit Data A (TXDA)	2	—————	2	Transmit Data A (TXDA)
Receive Data A (RXDA)	3	—————	4	Receive Data A (RXDA)
Signal Ground (Receive Data)	7	—————	8	Signal Ground
Interface Automatic Identifier	12	—————		
Indicate B (INDB)	13	—————	12	Indicate B (INDB)
Transmit Data B (TXDB)	14	—————	9	Transmit Data B (TXDB)
Indicate A (INDA)	15	—————	5	Indicate A (INDA)
Receive Data B (RXDB)	16	—————	11	Receive Data B (RXDB)
Clock A (CLKA)	17	—————	6	Clock A (CLKA)
Clock B (CLKB)	19	—————	13	Clock B (CLKB)
Control B (CTRLB)	23	—————	10	Control B (CTRLB)
Control A (CTRLA)	24	—————	3	Control A (CTRLA)

V.24/V.28

The DTE port terminates with a 26-way miniature SCSI connector. The port can be configured to support V.24 or V.28 signalling characteristics. The DTE port connecting cable is not supplied with the module. The following signalling characteristics should be observed when purchasing or fabricating a suitable cable.



3Com end – pin no.
(26-way male SCSI connector)

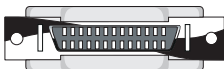


Client end – pin no.
(25-way male or female D-type)

Transmit Data A (TXDA)	2	—————	2	Transmit Data A (TXDA)
Receive Data (RXD 103)	3	—————	3	Receive Data (RXD 103)
Request to Send (RTS 105)	4	—————	4	Request to Send (RTS 105)
Clear to Send (CTS 106)	5	—————	5	Clear to Send (CTS 106)
Signal Ground (102)	7	} ————	7	Signal Ground (102)
Data Carrier Detect (DCD 109)	8		8	Data Carrier Detect (DCD 109)
Signal Ground (autosense)	11			
Signal Ground (autosense)	12			
Transmit Clock (TXCLK 114)	15	—————	15	Transmit Clock (TXCLK 114)
Receive Clock (RXCLK 115)	17	—————	17	Receive Clock (RXCLK 115)
Analog Loop Test (141)	18	—————	18	Analog Loop Test (141)
Data Terminal Ready (DTR 108)	20	—————	20	Data Terminal Ready (DTR 108)
Remote Digital Loop Test (140)	21	—————	21	Remote Digital Loop Test (140)
External Clock (EXCLK)	24	—————	24	External Clock (EXCLK)

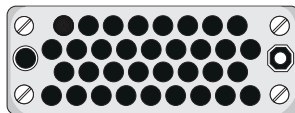
V.35/V.36

The DTE port terminates with a 26-way miniature SCSI connector. The port can be configured to support V.36 signalling characteristics. The DTE port connecting cable is not supplied with the module. The following signalling characteristics should be observed when purchasing or fabricating a suitable cable.



3Com end – pin no.

(26-way male SCSI connector)



Client end – pin no.

(34-way MRAC Connector)

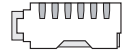
Transmit Data A (TXDA 103)	2	————— P	Transmit Data (TXD 103)
Receive Data A (RXDA 104)	3	————— R	Receive Data (RXD 103)
Request to Send (RTS 105)	4	————— C	Request to Send (RTS 105)
Clear to Send (RTS 106)	5	————— D	Clear to Send (RTS 106)
Data Set Ready (DSR 107)	6	————— E	Data Set Ready (DSR 107)
Signal Ground (102)	7	————— B	Signal Ground (102)
Data Carrier Detect (DCD 109)	8	————— F	Data Carrier Detect (DCD 109)
Interface Automatic Identifier	11		
Serial Clock Transmit B (SCTB 114)	13	————— AA	Serial Clock Transmit A (SCTB 114)
Transmit Data B (TXDB 103)	14	————— S	Transmit Data B (TXDB 103)
Serial Clock Transmit A (SCTA 114)	15	————— Y	Serial Clock Transmit A (SCTB 114)
Receive Data B (RXDB 104)	16	————— T	Receive Data B (RXDB 104)
Serial Clock Receive A (SCRA 115)	17	————— V	Serial Clock Receive A (SCRA 115)
Serial Clock Transmit B (SCRB 115)	19	————— X	Serial Clock Transmit B (SCRB 115)
Data Terminal Ready (DTR 108)	20	————— H	Data Terminal Ready (DTR 108)

PSTN Port Cable Pin Assignments

Each modem on the communications card is equipped with a single PSTN line port, which is accessed via the appropriate DIAL LINE socket on the card's interface module (refer to the rear panel diagram in Section 1.2 for an exact reference of which socket services which modem on the communications card). This is an RJ11 type socket, that would typically be connected to a PSTN telephone wall socket using a cable conforming to the wiring diagram shown below:



3Com end – pin no.
(RJ-11 male type)



Client end – pin no.
(BT male type
BT wall socket plug)

SHUNT	1	—————	4
A	3	—————	2
B	4	—————	5
EARTH	6	—————	3

Private Line Port Cable Pin Assignments

Each modem on the communications card is equipped with a single Private line port supporting either a 2- or 4-wire connection, which is accessed via the appropriate PRIVATE LINE socket on the card's interface module (refer to the rear panel diagram in Section 1.2 for an exact reference of which socket services which modem on the communications card). This is an RJ11 type socket, that would typically be connected to a 2- or 4-wire private line outlet using a cable conforming to the wiring diagram shown below:



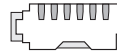
3Com end – pin no.
(RJ-11 male type)

TX_2W_1 1 ————— 6

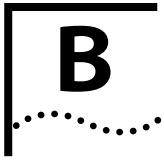
RX_4W_1 3 ————— 5

RX_4W_2 4 ————— 2

TX_2W_2 6 ————— 3



Client end – pin no.
(RJ-45 male type – private line)



TECHNICAL SUPPORT

3Com provides easy access to technical support information through the variety of services described in this appendix.

On-line Technical Services

3Com offers worldwide product support seven days a week, 24 hours a day, through the following on-line systems:

- 3Com Bulletin Board Service (3ComBBS)
- World Wide Web site

3Com Bulletin Board Service

3ComBBS contains patches, software, and drivers for all 3Com products, as well as technical articles. This service is available via modem or ISDN seven days a week, 24 hours a day.

Access by Modem

To reach the service by modem, set your modem to 8 data bits, no parity, and 1 stop bit.

Call the telephone number nearest you:

Country	Data Rate	Telephone Number
Australia	up to 14400 bps	(61) (2) 9955 2073
France	up to 14400 bps	(33) (1) 69 86 69 54
Germany	up to 9600 bps	(49) (89) 627 32 188 or (49) (89) 627 32 189
Hong Kong	up to 14400 bps	(852) 2537 5608
Italy (fee required)	up to 14400 bps	(39) (2) 273 00680
Japan	up to 14400 bps	(81) (3) 3345 7266
Singapore	up to 14400 bps	(65) 534 5693
Taiwan	up to 14400 bps	(886) (2) 377 5838
U.K.	up to 28800 bps	(44) (1442) 278278
U.S.	up to 28800 bps	(1) (408) 980 8204

Access by ISDN

ISDN users can dial-in to 3ComBBS using a digital modem for fast access up to 56 Kbps. To access 3ComBBS using ISDN, dial the following number:

(1) (408) 654-2703

World Wide Web Site

Access the latest networking information on 3Com's World Wide Web site by entering our URL into your Internet browser:

<http://www.3Com.com/>

This service features news and information about 3Com products, customer service and support, 3Com's latest news releases, selected articles from 3TECH™ (3Com's award-winning technical journal) and more.

Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Diagnostic error messages
- A list of system hardware and software, including revision levels
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to receive support from your network supplier, technical support contracts are available from 3Com.

In the U.S. and Canada, call **(800) 876-3266** for customer service.

If you are outside the U.S. and Canada, contact your local 3Com sales office to find your authorized service provider:

Country	Telephone Number	Country	Telephone Number
Australia (Sydney)	(61) (2) 959 3020	Japan	(81) (3) 33457251
(Melbourne)	(61) (3) 653 9515	Mexico	(525) 531 0591
Belgium*	0800 71429	Netherlands*	06 0227788
Brazil	(55) (11) 546 0869	Norway*	800 13376
Canada	(905) 882 9964	Singapore	(65) 538 9368
Denmark*	800 17309	South Africa	(27) (11) 803 7404
Finland*	0800 113153	Spain*	900 983125
France*	05 917959	Sweden*	020 795482
Germany*	0130 821502	Taiwan	(886) (2) 577 4352
Hong Kong	(852) 868 9111	United Arab Emirates	(971) (4) 349049
Ireland*	1 800 553117	U.K.*	0800 966197
Italy*	1678 79489	U.S.	(1) (408) 492 1790

* These numbers are toll-free.

Returning Products for Repair

A product sent directly to 3Com for repair must first be assigned a Return Materials Authorization (RMA) number. A product sent to 3Com without an RMA number will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
U.S. and Canada	(800) 876 3266, option 2	(408) 764 7120
Europe	31 30 60 29900, option 5	(44) (1442) 275822
Outside Europe, U.S., and Canada	(1) (408) 492 1790	(1) (408) 764 7290

11/29/95



INDEX

Numerics

3Com Bulletin Board Service (3ComBBS) D-1
3Com sales offices D-4

A

ALARM LED 2-7
ALERT LED 2-7
ANS LED 2-6

B

bulletin board service D-1

C

cable pin-outs A-8
CH 1 LED 2-7
CH 2 LED 2-7
CH 3 LED 2-7
COMP LED 2-6
CONN LED 2-6
connecting cables 2-5
CORR LED 2-6

D

DTE ports 2-5

F

features 1-2
front card installation 2-4

I

installation 2-2
 front card 2-4
 prerequisites 1-7
 rear card 2-3

L

LED selection button 2-7
LEDs, front panel 2-6
LINE LED 2-6

N

network supplier support D-3

O

on-line technical services D-1

P

pack contents 1-6
ports 2-5
pre-installation requirements 1-7
PSTN line ports 2-5
push button 2-7
PWR LED 2-7

R

rear card installation 2-3
REC LED 2-7
returning products for repair D-5

S

SEND LED 2-7

T

technical information A-1

technical support D-1

TERM LED 2-6

TEST LED 2-7

Triple Modem

 features 1-2

 overview 1-1

 typical applications 1-5

troubleshooting 3-1

typical applications 1-5

V

V.32terbo 1-3

LIMITED WARRANTY

HARDWARE: 3Com warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for the following lengths of time from the date of purchase from 3Com or its Authorized Reseller:

Internetworking products	One year
Network adapters	Lifetime
Ethernet stackable hubs and unmanaged Ethernet fixed port repeaters	Lifetime* (One year if not registered)
*Power supply and fans in these stackable hubs and unmanaged repeaters	One year
Other hardware products	One year
Spare parts and spares kits	90 days

If a product does not operate as warranted above during the applicable warranty period, 3Com shall, at its option and expense, repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of 3Com. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

3Com shall not be responsible for any software, firmware, information, or memory data of Customer contained in, stored on, or integrated with any products returned to 3Com for repair, whether under warranty or not.

SOFTWARE: 3Com warrants that the software programs licensed from it will perform in substantial conformance to the program specifications therefor for a period of ninety (90) days from the date of purchase from 3Com or its Authorized Reseller. 3Com warrants the media containing software against failure during the warranty period. No updates are provided. 3Com's sole obligation with respect to this express warranty shall be (at 3Com's discretion) to refund the purchase price paid by Customer for any defective software products, or to replace any defective media with software which substantially conforms to 3Com's applicable published specifications. Customer assumes responsibility for the selection of the appropriate applications program and associated reference materials. 3Com makes no warranty or representation that its software products will work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the 3Com software product documentation or specifications as being compatible, 3Com will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a "bug" or defect in the third party's product.

STANDARD WARRANTY SERVICE: Standard warranty service for hardware products may be obtained by delivering the defective product, accompanied by a copy of the dated proof of purchase, to 3Com's Corporate Service Center or to an Authorized 3Com Service Center during the applicable warranty period. Standard warranty service for software products may be obtained by telephoning 3Com's Corporate Service Center or an Authorized 3Com Service Center, within the warranty period. Products returned to 3Com's Corporate Service Center must be pre-authorized by 3Com with a Return Material Authorization (RMA) number marked on the outside of the package, and sent prepaid, insured, and packaged appropriately for safe shipment. The repaired or replaced item will be shipped to Customer, at 3Com's expense, not later than thirty (30) days after receipt of the defective product by 3Com.

WARRANTIES EXCLUSIVE: IF A 3COM PRODUCT DOES NOT OPERATE AS WARRANTED ABOVE, CUSTOMER'S SOLE REMEDY FOR BREACH OF THAT WARRANTY SHALL BE REPAIR, REPLACEMENT, OR REFUND OF THE PURCHASE PRICE PAID, AT 3COM'S OPTION. TO THE FULL EXTENT ALLOWED BY LAW, THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, TERMS, OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES, TERMS, OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND SATISFACTORY QUALITY. 3COM NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

3COM SHALL NOT BE LIABLE UNDER THIS WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY CUSTOMER'S OR ANY THIRD PERSON'S MISUSE, NEGLIGENCE, IMPROPER INSTALLATION OR TESTING, UNAUTHORIZED ATTEMPTS TO REPAIR OR MODIFY, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING, OR OTHER HAZARD.

LIMITATION OF LIABILITY. TO THE FULL EXTENT ALLOWED BY LAW 3COM ALSO EXCLUDES FOR ITSELF AND ITS SUPPLIERS ANY LIABILITY, WHETHER BASED IN CONTRACT OR TORT (INCLUDING NEGLIGENCE), FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, OR FOR LOSS OF REVENUE OR PROFITS, LOSS OF BUSINESS, LOSS OF INFORMATION OR DATA, OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE, USE, PERFORMANCE, FAILURE, OR INTERRUPTION OF ITS PRODUCTS, EVEN IF 3COM OR ITS AUTHORIZED RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND LIMITS ITS LIABILITY TO REPAIR, REPLACEMENT, OR REFUND OF THE PURCHASE PRICE PAID, AT 3COM'S OPTION. THIS DISCLAIMER OF LIABILITY FOR DAMAGES WILL NOT BE AFFECTED IF ANY REMEDY PROVIDED HEREIN SHALL FAIL OF ITS ESSENTIAL PURPOSE.

Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages for certain products supplied to consumers, so the above limitations and exclusions may be limited in their application to you. This warranty gives you specific legal rights which may vary depending on local law.

GOVERNING LAW: This Limited Warranty shall be governed by the laws of the state of California.

3Com Corporation

5400 Bayfront Plaza
Santa Clara, CA 95052-8145
(408) 764-5000

3/18/96

FCC CLASS A VERIFICATION STATEMENT

This equipment has been tested with a class A computing device and has been found to comply with part 15 of FCC Rules. Operation in a residential area may cause unacceptable interference to radio and TV receptions requiring the operator to take whatever steps are necessary to correct the interference.

CSA Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le ministre des Communications.

European Statement

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Information To The User

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

How to Identify and Resolve Radio-TV Interference Problems

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

In order to meet FCC emissions limits, this equipment must be used only with cables which comply with IEEE 802.3.

